# Tennessee's Racial Disparity in Infant Mortality

TENNESSEE DEPARTMENT OF HEALTH

It's About Time!

**Special Report 2006**

# Tennessee's
# Racial Disparity in Infant Mortality


## TENNESSEE DEPARTMENT OF HEALTH

### OFFICE OF POLICY, PLANNING, AND ASSESSMENT


## Project Team


**Christopher Corniola, MA, MPH**
**Frederick Croom, MD**
**Pramod Dwivedi, MA, MSW, MS**
**Ivan Foster, BA**


**March 2006**


**Suggested Citation**

Racial Disparity in Infant Mortality in Tennessee. Office of Policy, Planning, and Assessment, Tennessee Department of Health, Nashville, Tennessee. 2006.

# Racial Disparity in Infant Mortality in Tennessee

## Introduction

This report is part of a major effort to address the infant mortality problem. The goal of the Tennessee Department of Health (TDH) is to reduce infant mortality in Tennessee to an incidence of no more than 7.0 infant deaths per 1,000 live born infants by the year 2010 (HP 2010 Objective 16-1c; Tennessee Department of Health BHIAT). A second goal set forth in the "Better Health: It's About Time" (BHIAT) initiative is the reduction in infant mortality racial disparity by 50 percent by 2010. In 2004, Tennessee's infant mortality rate was 8.6 per 1,000 live born infants which was substantially higher than the national rate of 6.6 per 1,000 live births[1]. (Infant mortality rate, "IMR", is defined as the number of infant deaths per 1,000 live births.)

The death of an infant is a tragedy and a traumatic event for the family. From a public health standpoint, infant mortality is an important health measure. The death of an infant not only reflects the current health status of a population but also gives an indication of maternal health, quality of care and access to care, socioeconomic conditions and public health interventions.

Note: This report includes data from two different data sets, the birth/infant death linked file from 1995 to 2002, and infant mortality death certificate data between 1994 and 2004 (see Technical Notes). Both data sources include only Tennessee resident data.

# Infant Mortality Time Trends

- The IMR among Tennessee residents has shown variability, having reached a low point in 1999 of 7.7 infant deaths per 1,000 live births.[2]
- The greatest increase in infant mortality in the past 10 years occurred between 1999 and 2000 (from 7.7/1,000 to 9.0/1,000) (Figure 1).
- In 2004 the infant mortality rate was 17.4/ 1,000 among African-Americans and 6.4 per 1,000 among whites.
- The disparities which exist between racial groups in Tennessee have been present for a long time (Figure 2).

**Figure 1**

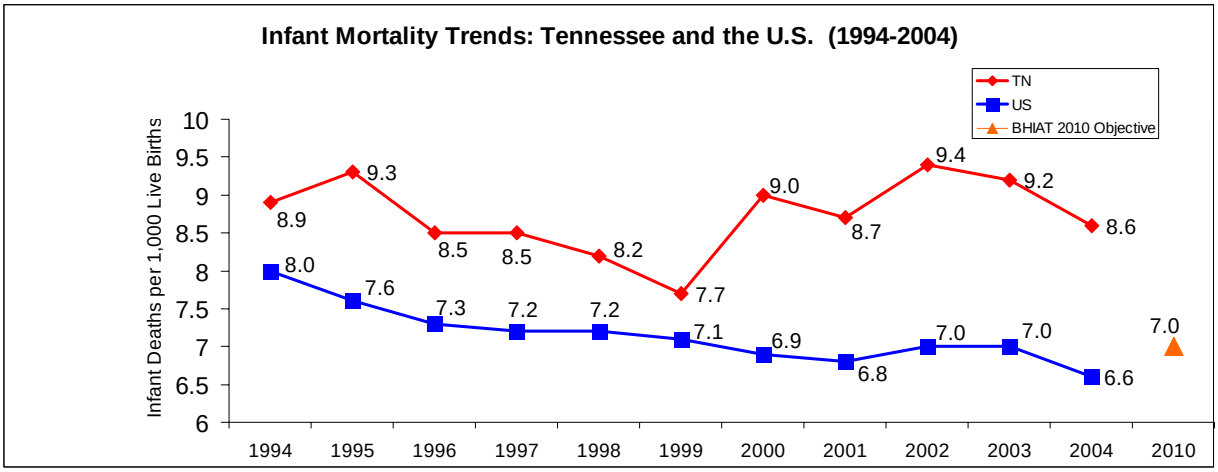
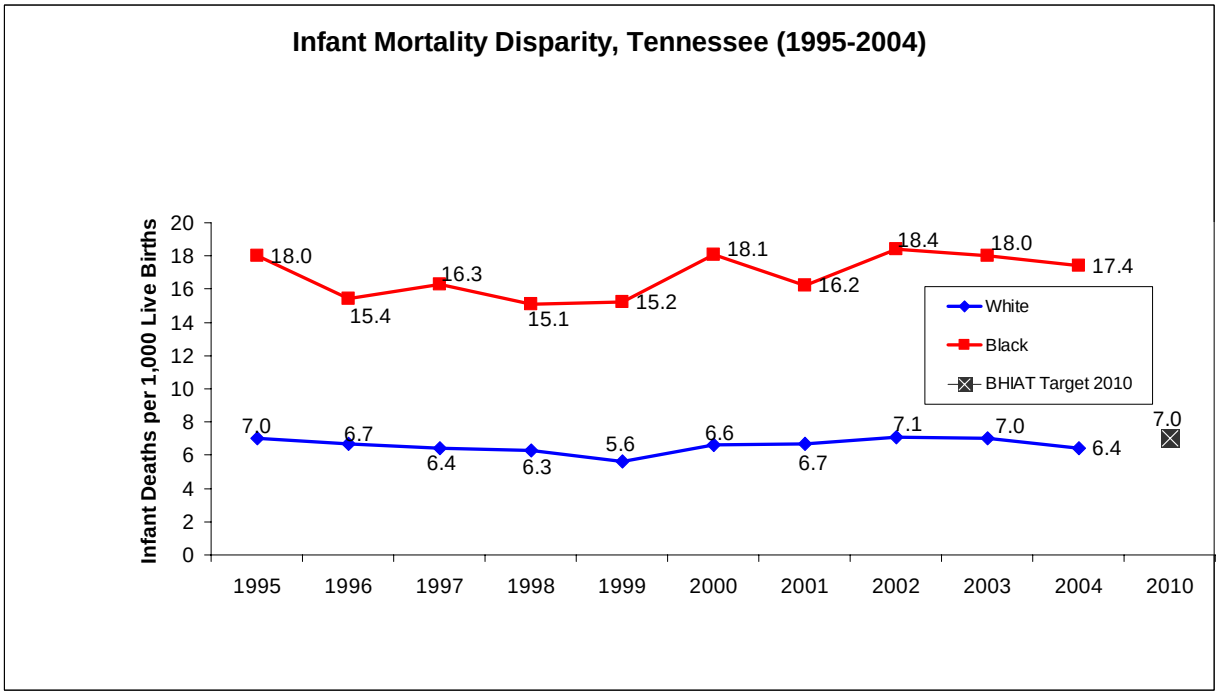


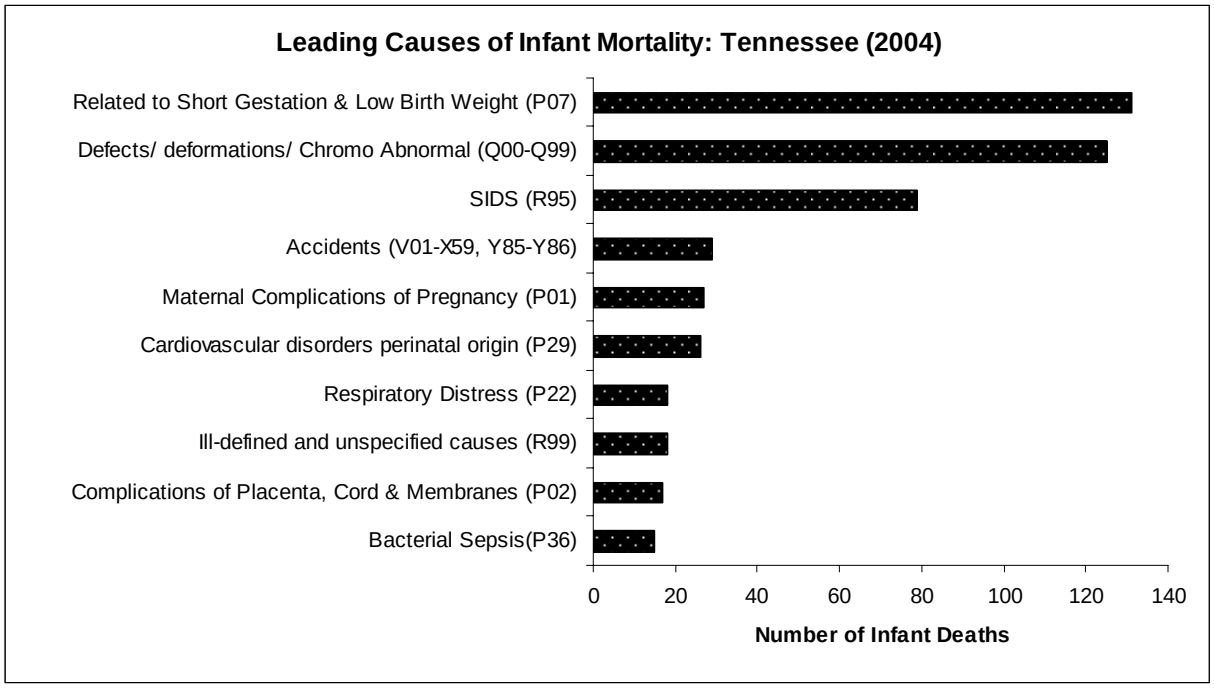

**Figure 2**



# Leading Causes of Infant Mortality

- The leading cause of infant mortality is the category of congenital malformations, deformities and chromosomal abnormalities. This includes a variety of irreversible conditions which ultimately result in the death of the infant (Figure 3).
- The second leading cause of infant mortality is the category of fatal conditions resulting from a short gestation period and/or low birth weight. In these cases, the size of the infant or lack of sufficient development creates a medical situation in which it is impossible to sustain life.
- Sudden Infant Death Syndrome (SIDS) is the third leading cause of infant mortality in Tennessee and is a phenomenon that is not completely understood.
- Accidents are the 4th leading cause of death of infants.

**Figure 3**



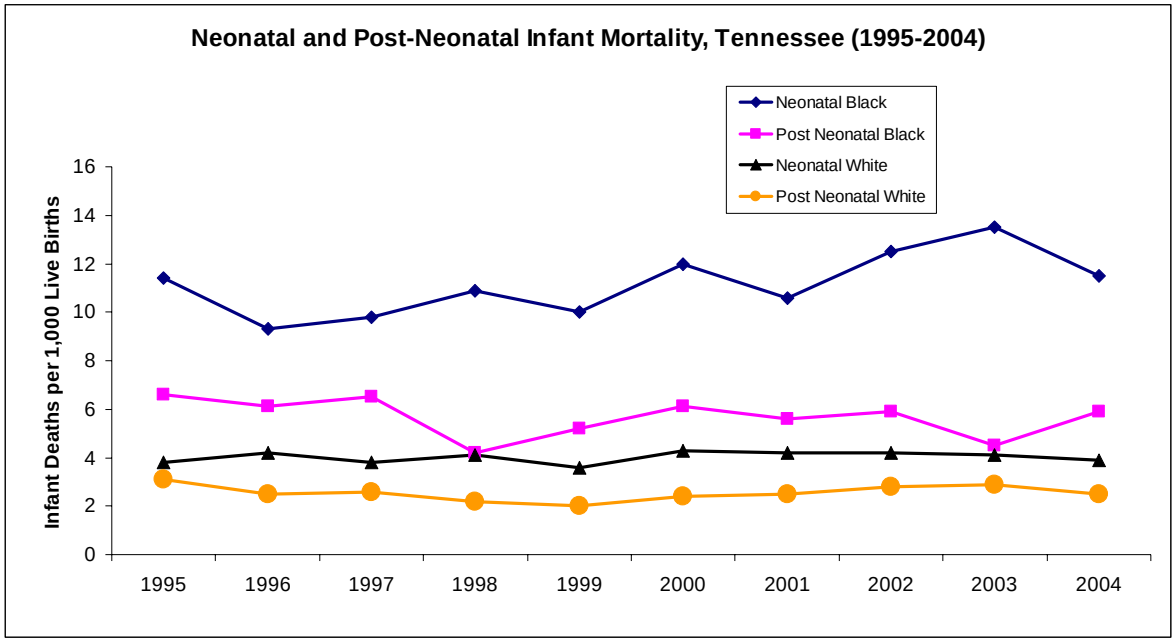
- Infants who die within minutes of birth usually die from short gestation/low birth weight or maternal complications of pregnancy (Table A).
- Severe malformations such as anencephaly also usually result in death within minutes.
- Infants who die within hours of birth usually die from cardiovascular disorders, congenital lung malformations and respiratory distress as well as similar causes of death as those who live for mere minutes.
- Infants who die within 1 to 27 days usually die from a variety of causes including respiratory distress, bacterial sepsis, disorders resulting from short gestation and low birth weight, SIDS, as well as from genetic disorders such as Patau's Syndrome (trisomy-13) and Edward's syndrome (trisomy-18).
- Infants who die between 28 days and one year of life usually die from a variety of causes including SIDS, heart malformations, accidental suffocation/strangulation, respiratory disease beginning in perinatal period, septicemia and pneumonia. (Table A).

**Table A:** Ranking of neonatal and post-neonatal causes of death-specific ICD-10 codes, Tennessee (1999-2004)

| | ICD-10 Label | < 60 minutes | 1-23 hours | 1 day - 27 days | 28 days - 12 months |
|---|---|---|---|---|---|
| P07 | Disorders related to short gestation and low birthweight, not elsewhere classified | 1 | 1 | 3 | |
| P01 | Newborn affected by maternal complications of pregnancy | 2 | 3 | | |
| P02 | Newborn affected by complications of placenta, cord, and membranes | 3 | 5 | | |
| P29 | Cardiovascular disorders originating in the perinatal period | 4 | 2 | | |
| P28 | Other respiratory conditions originating in the perinatal period | 5 | 6 | | |
| Q00 | Anencephaly and similar malformations | 6 | | | |
| Q89 | Other congenital malformations, not elsewhere classified | 7 | | | |
| P22 | Respiratory distress of newborn | | 4 | 1 | |
| Q33 | Congenital malformations of lung | | 7 | | |
| P36 | Bacterial sepsis of newborn | | | 2 | |
| P52 | Intracranial nontraumatic hemorrhage of fetus and newborn | | | 4 | |
| P77 | Necrotizing enterocolitis of newborn | | | 5 | |
| Q91 | Edwards' syndrome and Patau's syndrome | | | 6 | |
| R95 | Sudden infant death syndrome | | | 7 | 1 |
| R99 | Other ill-defined and unspecified causes of mortality | | | | 2 |
| Q24 | Other congenital malformations of heart | | | | 3 |
| W75 | Accidental suffocation and strangulation in bed | | | | 4 |
| J18 | Pneumonia, organism unspecified | | | | 5 |
| P27 | Chronic respiratory disease originating in the perinatal period | | | | 6 |
| A41 | Non-Streptococcal Septicemia | | | | 7 |

- African-American neonates experienced the highest infant mortality rate of any group (Figure 4).

**Figure 4**




# Race

- In 2004, African-American babies were dying at a rate over two and a half times the rate of white babies (17.4/ 1,000 vs. 6.4/ 1,000).
- Mortality related to short gestation and low birth weight is a greater problem for African-Americans than for whites and is the leading cause of neonatal death for African-Americans (Table B).
- The leading cause of deaths for whites is the category of congenital malformations.

| TABLE B: Leading Causes of Infant Death by Race, Tennessee (1999-2004) | African-Americans | Whites |
|---|---|---|
| (P07) Short gestation, low birthweight | **1** | **2** |
| (Q00-Q99) Congenital malformations, deformations & chromosomal abnormalities | **2** | **1** |
| (R95) SIDS | **3** | **3** |
| (P29) Cardiovascular disorders originating in the perinatal period | **4** | **9** |
| (P22) Respiratory Distress | **5** | **5** |
| (V01-X59, Y85-Y86) Accidents | **6** | **4** |
| (P01) Maternal Complications | **7** | **6** |
| (P36) Bacterial Sepsis | **8** | **7** |
| (P02) Complications of Placenta, Cord & Membranes | **9** | **7** |
| (P77) Necrotizing enterocolitis of newborn | **10** | **12** |
| (P28) Other respiratory conditions originating in the perinatal period | **11** | **9** |
| (R99) Other ill-defined and unspecified causes of mortality | **12** | **8** |
| (P50-P52, P54) Neonatal Hemorrhage | **13** | **10** |
| (P21) Birth asphyxia | **14** | **11** |

# Geographical Variation

- Infants born to mothers living in rural areas had a lower IMR, demonstrating a rate of 7.0/ 1,000 live births compared to 10.3/ 1,000 live births among urban dwellers during 1995-2002.[3]
- Shelby County had an IMR of 12.8/ 1,000 in 2004. This is over 1.65 times (65% higher) than the rest of the state[4].
- The IMR in the Mid-Cumberland, Upper Cumberland, Southeast, East and Knox regions are lower than both the Tennessee and U.S. national average (Figure 5).
- IMR varies considerably from county to county (Figure 6).
- The relationship between the poverty level in each county and the infant mortality rate is inconsistent. There are a number of counties which have both high poverty levels and high IMR such as Morgan County and Johnson County. However, there are also counties with low poverty levels and high IMR such as Gibson County as well as counties with high poverty levels and low IMR such as Lake County and Bledsoe County.
- Hispanics are typically more likely to be in poverty; however, they have the lowest IMR, so the cause and effect relationship of poverty and IMR is not a simple one.

**Figure 5**

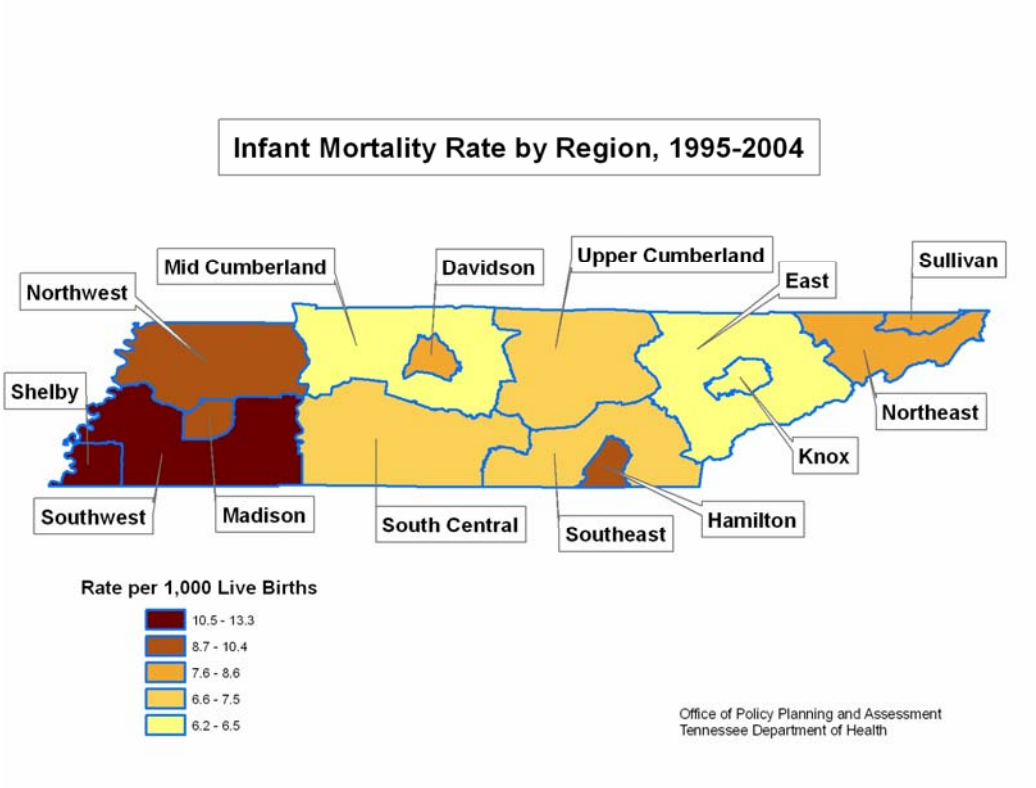



**Figure 6**

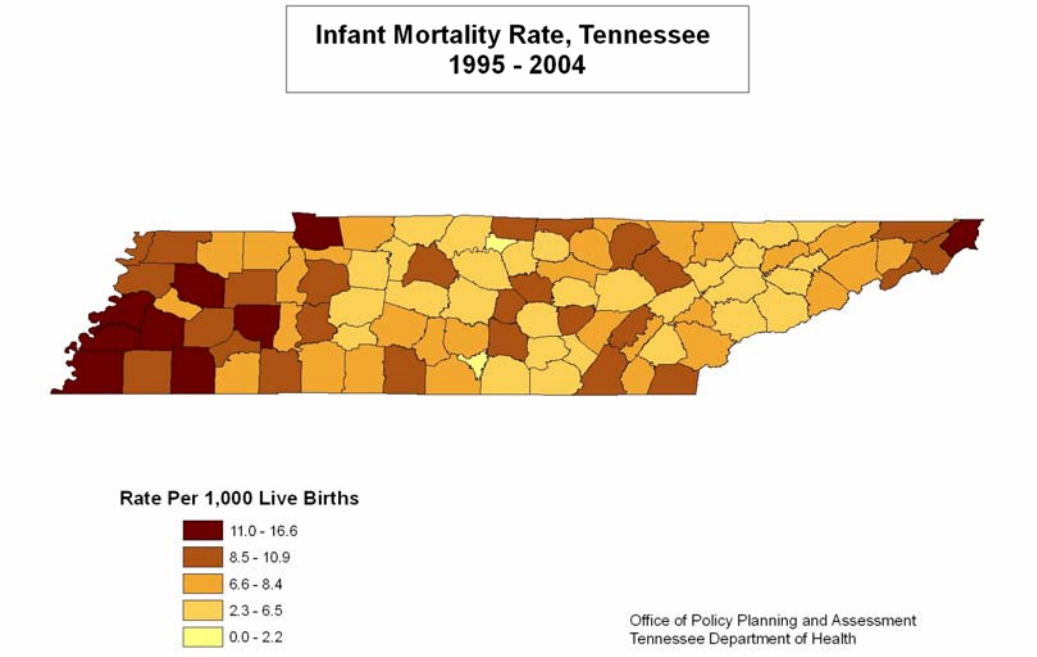


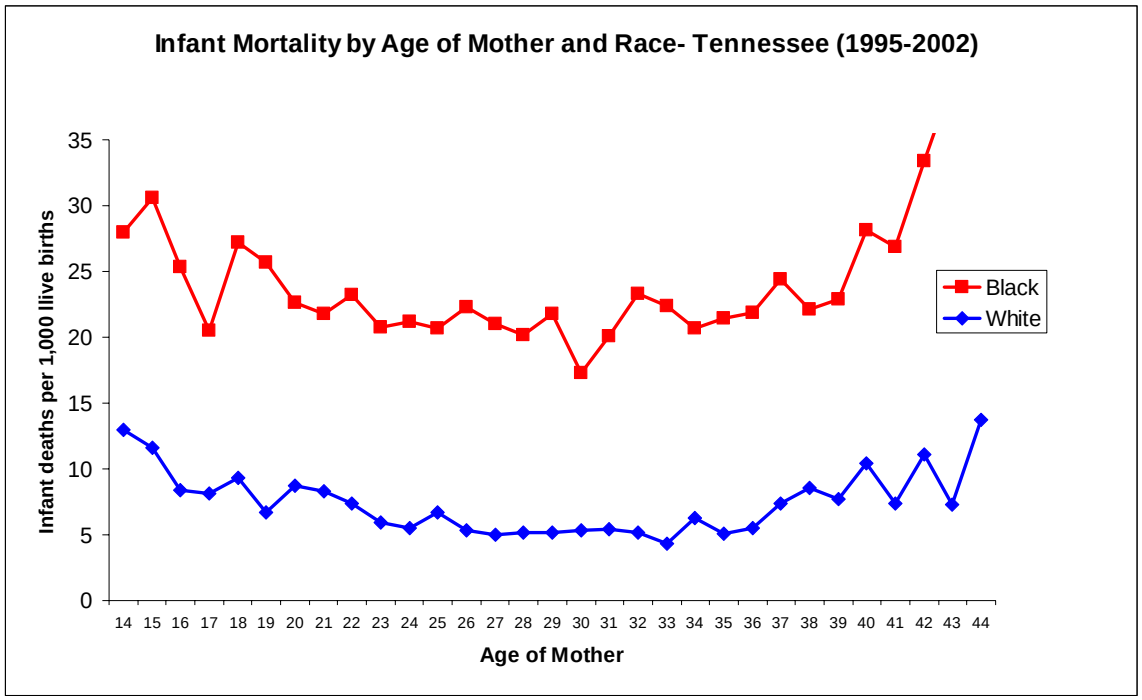
**Table C**: Highest and Lowest County-Level Infant Mortality Rates, Tennessee 1995-2004 Aggregate.

| County | Rate | # of Infant Deaths | Rank |
|---|---|---|---|
| HARDEMAN | **16.6** | 56 | 1 |
| SHELBY | **13.3** | 1936 | 2 |
| TIPTON | **12.9** | 91 | 3 |
| HAYWOOD | **12.8** | 37 | 4 |
| JOHNSON | **12.8** | 20 | 5 |
| GIBSON | **12.3** | 74 | 6 |
| | | | |
| WILLIAMSON | **4.6** | 74 | 90 |
| JEFFERSON | **4.4** | 22 | 91 |
| SMITH | **4.2** | 9 | 92 |
| GRUNDY | **4.0** | 8 | 93 |
| TROUSDALE | **2.2** | 2 | 94 |
| MOORE | **0** | 0 | 95 |

# Age

- Infant mortality is lowest when the mother is in her mid-twenties to early thirties (Figure 7).
- African-Americans consistently have a higher infant mortality rate than whites across the mothers' age spectrum.

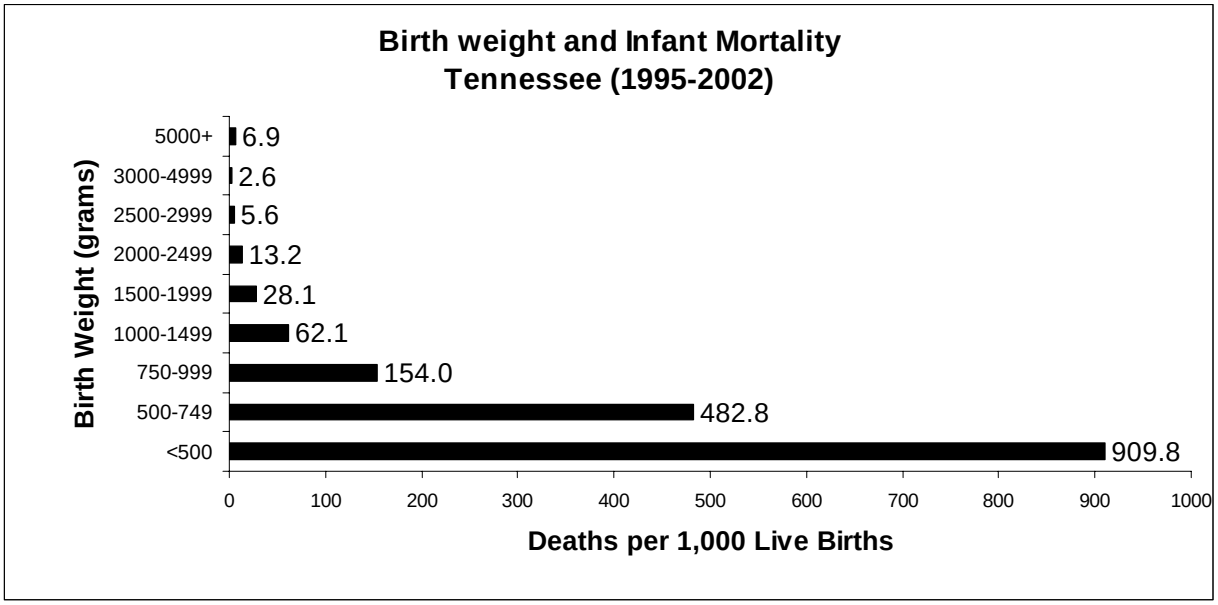
**Figure 7**



# Birth Weight

- Infant mortality was closely correlated with birthweight in 1995-2002 (Figure 8).
    1. Among normal birth weight infants (2,500 grams or more) the infant mortality rate was 3.3 per 1,000 live births.
    2. Among low birth weight infants (1,500 to 2,499 grams) the rate was 61.2 per 1,000 live births, which is over 18 times the normal birth weight mortality rate.
    3. Among very low birth weight infants (less than 1,500 grams at birth) the infant mortality rate was 255.5 per 1,000 live births. Over a quarter of these very low birth weight infants died and the proportion which died was over 77 times that of normal birth weight infants.
- Although the 2,500-2,999 gram birth weight category is considered normal, the IMR actually drops considerably for infants in the 3,000 – 4,999 gram category, from 5.6 infant deaths per 1,000 live births in the 2,500-2,999 gram birth weight to only 2.6 infant deaths per 1,000 live births in this 3,000-4,999 gram category.

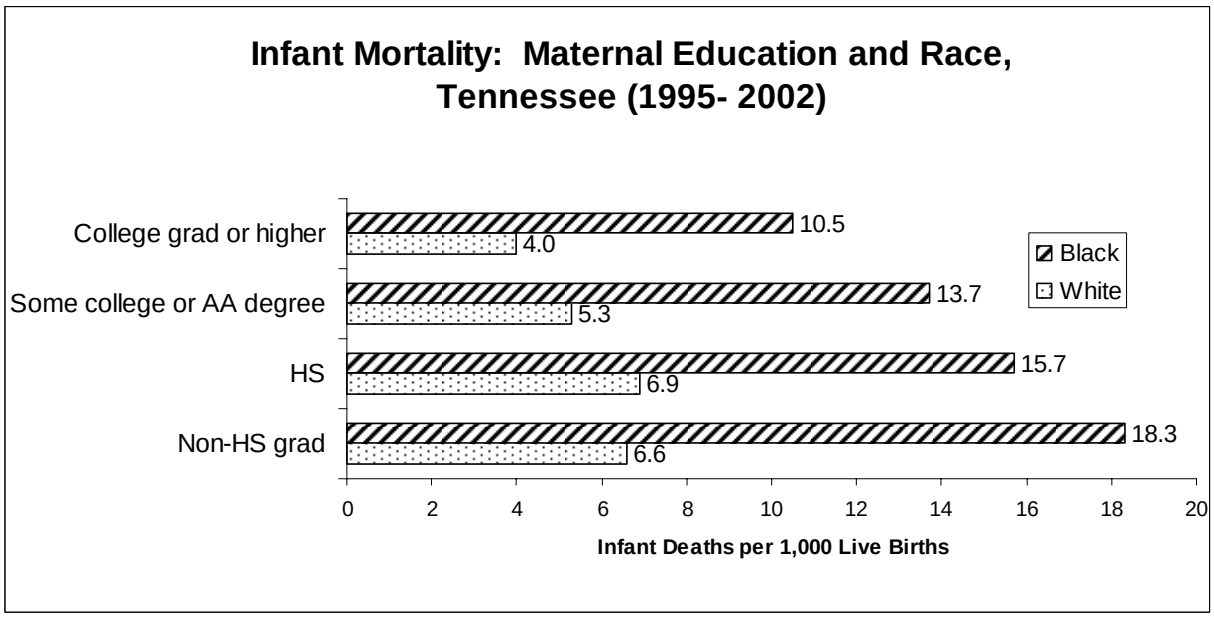
**Figure 8**




# Education

- There appear to be deeper reasons for racial IMR disparity than education and socioeconomic status (SES), as evidenced in the fact that during 1995-2002, a non-smoking African-American woman with a college education had a higher infant mortality rate (13.1/1,000) than a smoking, white woman who had not graduated from high school (12.3/1,000).
- Education appears to be a protective factor but lack of education alone does not explain racial IMR disparities (Figure 9).

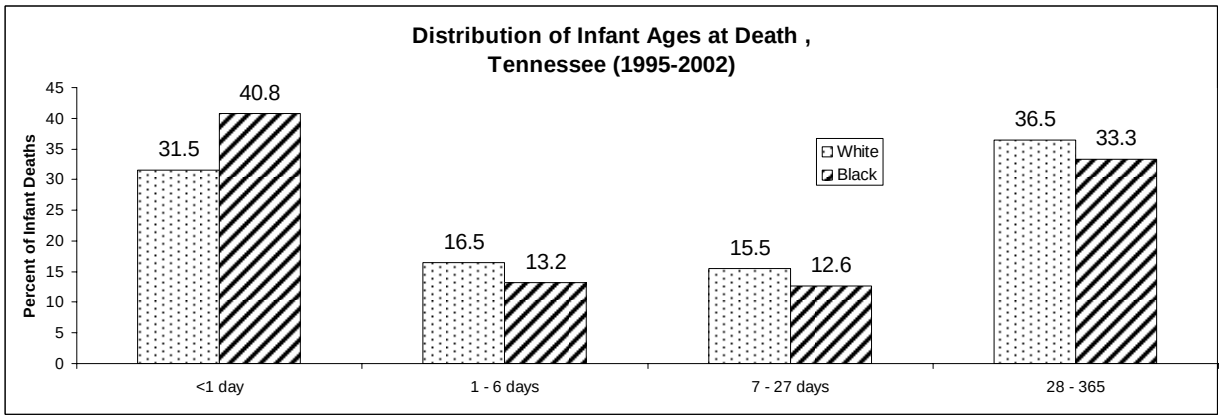
**Figure 9**




# Timing

- When infant deaths occur, they are more likely to occur in the first days or first month of life (Figure 10).
- With each passing unit of time the likelihood of infant death decreases.

**Figure 10**




# Gestation Period

- Giving birth prematurely is strongly associated with increased infant mortality, more so among African-Americans than whites (Figure 11).
- Further exacerbating the racial disparity is the fact that not only do African-Americans have a higher mortality rate among non full-term infants but they also have a higher percentage of infants born before 37 weeks of gestation (Figure 12).

**Figure 11**

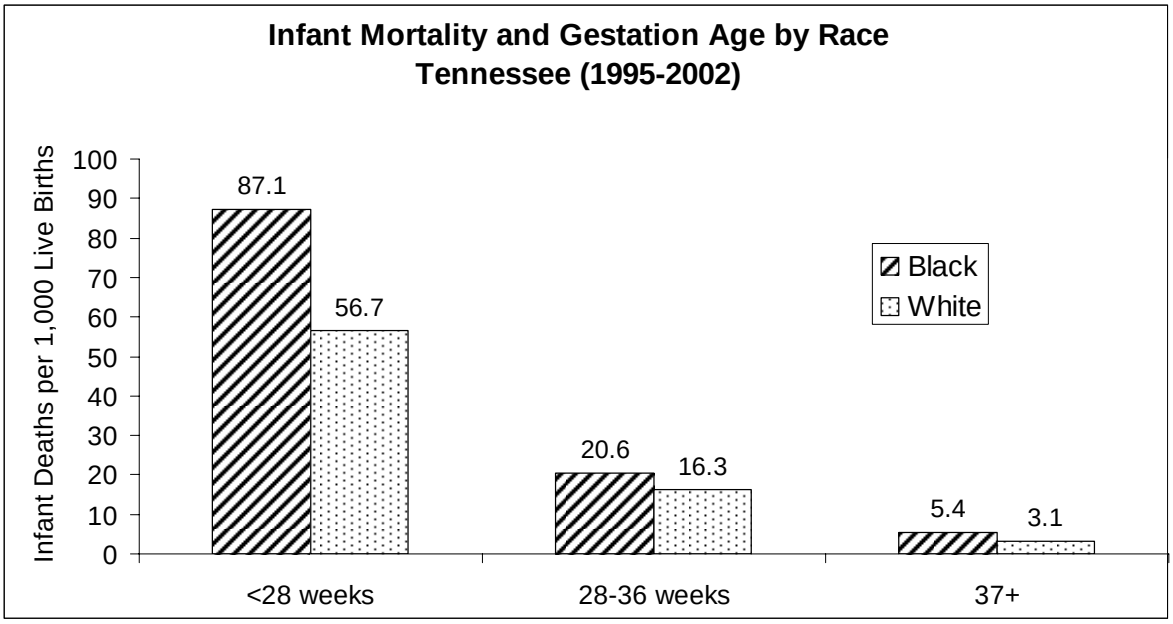
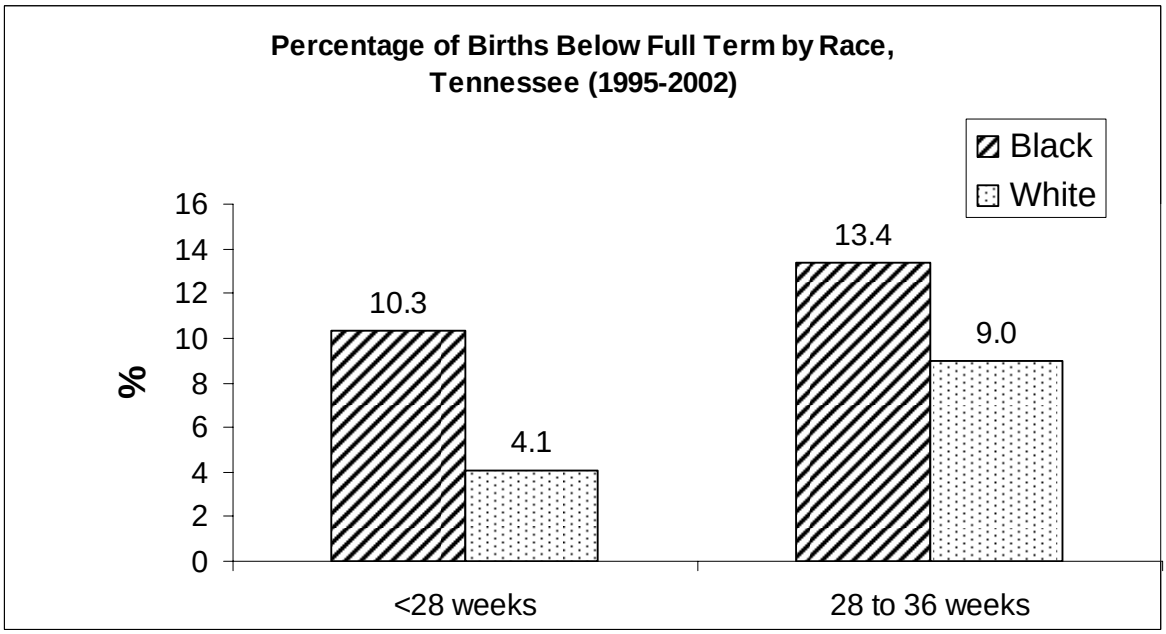



**Figure 12**

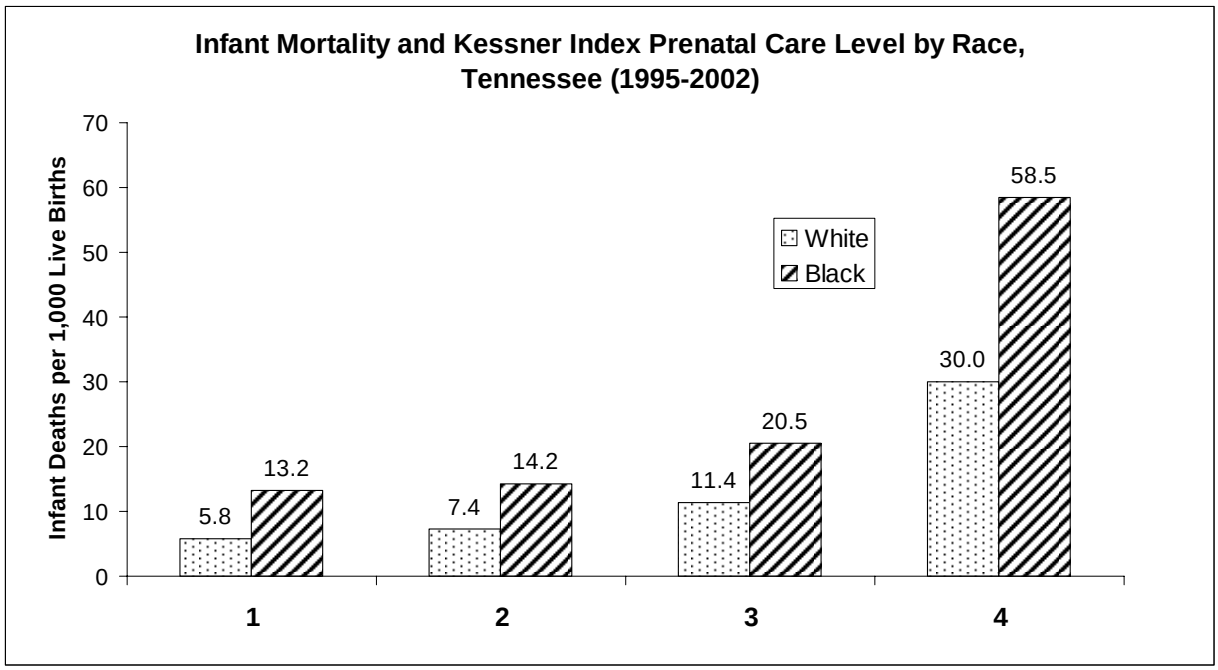



# Prenatal Care

- Among African-American infants in 1995-2002, whose mother did not receive prenatal care, the IMR is 58.5/ 1,000 births and among whites the IMR is 30.0/ 1,000 live births for those with no prenatal care (Figure 13).
- As is expected, in each racial group infants with a better Kessner index[5] rating (a lower number) had lower mortality rates.

- African-American infants with the same Kessner index rating as white infants had mortality rates approximately double the rates of whites.
- Prenatal care clearly lowered infant mortality rate, but lack of prenatal care alone does not explain racial disparities in infant mortality.

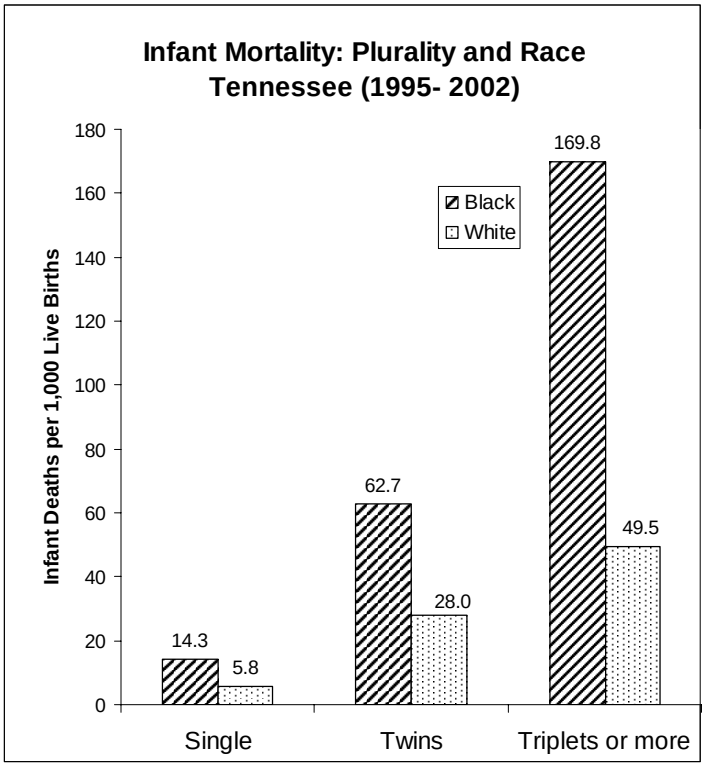
**Figure 13**




# Plurality

- Mothers giving birth to multiple babies are at a higher risk for losing a child within the first year of life.
- The IMR for twins is over 4 times the rate for singleton babies.
- The infant mortality among triplets or more is over 8 times the rate for singleton births, among whites and nearly 12 times higher among African-Americans (Figure 14).

**Figure 14**




## Risk Factors Summary

- A woman is at higher risk for an infant mortality:
  1. if she has no prenatal care;
  2. if she smokes or drinks;
  3. if she is in her forties;
  4. if she gives birth to twins (or more);
  5. if she does not finish high school;
  6. if she lives in an urban environment
- Table D specifies the IMR related to various child and maternal factors.

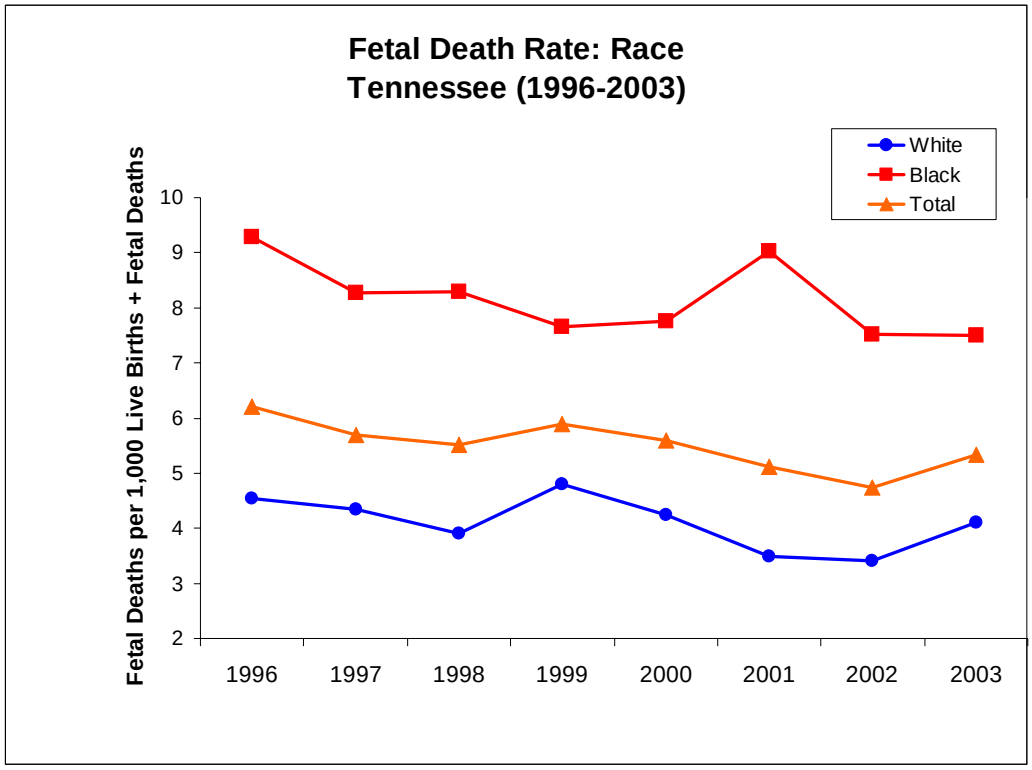
Table D: Infant Mortality Rate of Selected Populations, Tennessee 1995-2003

| Higher Infant Mortality Rate (rate per 1,000) | Lower Infant Mortality Rate (rate per 1,000) |
|---|---|
| **African-American - 18.0 (2003)** | **White- 7.0 (2003)** |
| **Single mother- 12.7** | **Married mother- 6.3** |
| **Premature birth (< 37 weeks)- 51.0** | **Normal gestation- 3.4** |
| **Twins or more- 37.5** | **Single birth- 7.7** |
| **No prenatal visits- 46.0** | **One or more prenatal visit- 8.0** |
| **Smoking mother- 12.0** | **Non-smoking mother- 7.7** |
| **Did not finish high school- 11.9** | **College graduate- 4.6** |
| **Urban dweller- 10.3** | **Rural- 7.4** |

# Fetal Death

- The definition of fetal death for the state of Tennessee is a fetal death of 500 grams or more, or, in the absence of weight, of 22 completed weeks of gestation or more, excluding induced abortions.
- The fetal death rate among African-Americans is nearly twice the rate among whites (Figure 15).

**Figure 15**

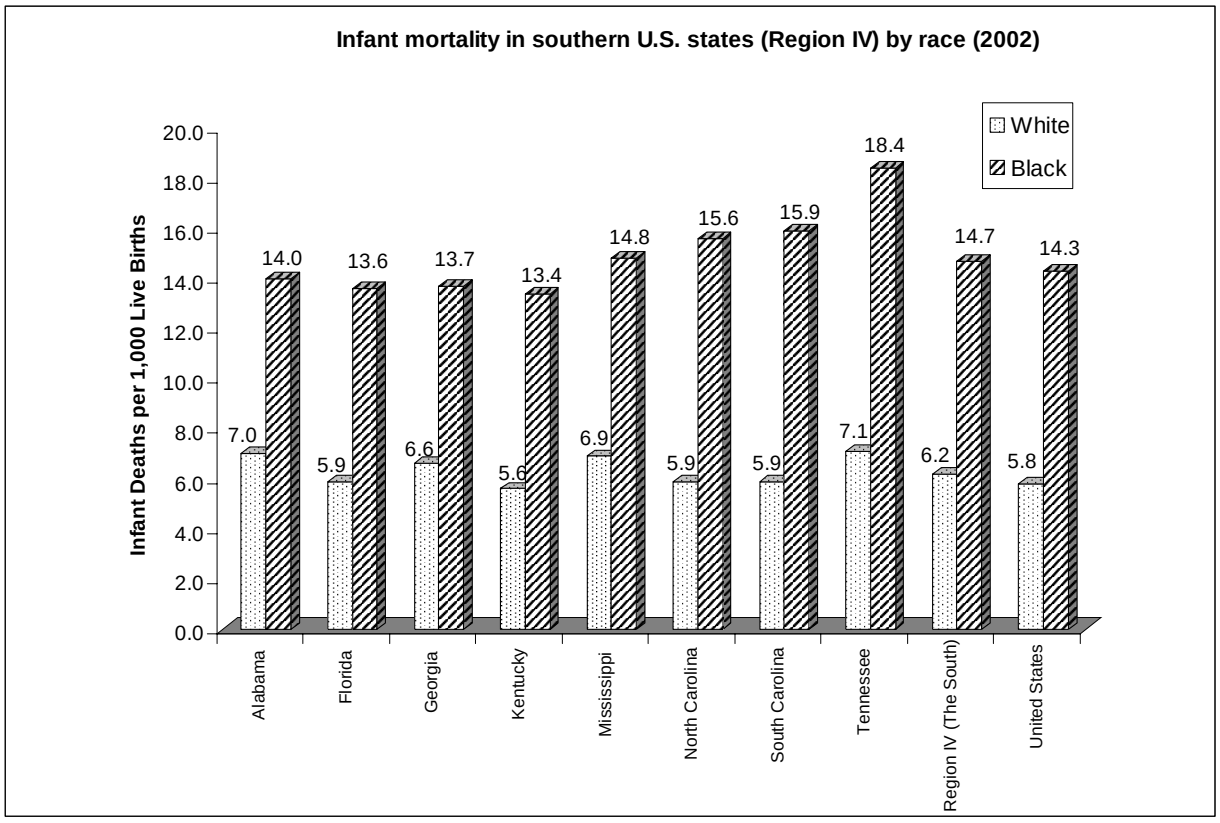



# Beyond Tennessee

How does Tennessee compare to other Region IV states?

- In 2002, Tennessee had the highest IMR for both African-Americans and whites in this group (Figure 16).

**Figure 16**




# Discussion:

There are a number of interventions which may decrease the infant mortality rate. Education (encouraging mothers to seek pre-natal care), smoking cessation (to decrease low birth weight infants), alcohol abstinence (to prevent congenital anomalies) and proper nutrition and exercise by pregnant women (to improve the health of both the mother and infant) are some positive factors. Education is a crucial key for decreasing the infant mortality rate and is the means to teach the importance of prenatal care to potential mothers.

The leading cause of infant death was found in the category of congenital malformations, deformations and chromosomal abnormalities. Abstinence from alcohol by pregnant women would address fetal alcohol syndrome. Ensuring sufficient folic acid intake is estimated to prevent up to 50 to 70 percent of neural tube defects such as spina bifida and anencephaly. [6]

The second leading cause of infant mortality in Tennessee is low birth weight or short gestation period. Multiple factors may contribute to low birth weight, including exposure to tobacco smoke, exposure to lead and malnourishment.

Sudden Infant Death Syndrome (SIDS) is the third leading cause of infant mortality in the state of Tennessee. It is believed that proper positioning for sleep may reduce the risk of an infant dying from SIDS.

Continuing to address infant mortality racial disparities is vital because of the elevated IMR among African-Americans. The reason for this disparity is not completely understood.

## Technical Notes:

Data for this report came from a variety of sources including the linked birth/death certificate data covering the 1995-2002 period, Department of Health HIT site and death certificate files for the state of Tennessee. For leading causes of death, death files for 1999-2004 were utilized in order to use ICD-10 codes. All of the data are resident data. For maps and trends we have used multiple year averages data which gives a more reliable indication of the true situation for each geographic area because of the small number of events of interest which may occur in any given year. Hispanics are included in the African-American and white racial categories because "hispanic" is a description of ethnicity, whereas "African-American" or "white" is a description of race.

## Key Definitions:

*Infant Mortality*: Death of a live birth between birth and the first birthday.

*Infant Mortality Rate*: Number of infant deaths per 1,000 live births.

*Neonate*: Infant between birth and 27 days old.

*Neonatal Mortality Rate*: Death of live birth between birth and 27 days.

*Post-neonate*: Infant between 28 days and one year old.

*Post-neonatal Death*: Death of a live birth between 28 days and the first birth day.

*Fetal Death*: A fetal death of 500 grams or more, or in the absence of weight, of 22 completed weeks of gestation or more. (Note: Induced abortions are excluded from the fetal death count.)

*Low Birthweight*: A live birth weighing less than 2,500 grams.

*Very Low Birthweight* (VLBW): A live birth weighing less than 1,500 grams.

*Extremely Low Birthweight*: Birth weight less than 1,000 grams.

*Kessner Index*: An indicator of the adequacy of prenatal care a mother receives during her pregnancy. Prenatal care is classified based on three criteria from the birth certificate: timing of the first prenatal visit; total number of prenatal visits; and length of gestation.

---

[1] The 2004 U.S. infant mortality rate is based on provisional data.
[2] Tennessee Department of Health HIT site
3 For the sake of the analysis of this report, "Urban" refers to a resident in one of the six urban counties: Shelby, Madison, Davidson, Knox, Hamilton and Sullivan. "Rural" counties are all other counties.
[4] In 2004 the total state IMR was 8.6/1,000. The Shelby County IMR was 12.8/1,000. The state IMR excluding Shelby County was 7.7/ 1,000.
[5]The Kessner Index is an indicator of the adequacy of prenatal care a mother receives during her pregnancy. Prenatal care is classified based on three criteria from the birth certificate: timing of the first prenatal visit; total number of prenatal visits; and length of gestation.
[6] CDC Foundation: http://www.cdcfoundation.org/healththreats/birthdefects.aspx

Tennessee Department of Health. Authorization No. 343787, 2,000 copies, April 2006. This public document was promulgated at a cost of $2.42 per copy.